

EIP Enterococci Study: Monitoring for the Seeds of Antimicrobial Resistance in the Food Supply

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Background: Giving antimicrobial agents to chickens and other food animals selects for antimicrobial resistance among bacteria (e.g., *Enterococcus faecalis*, *E. faecium*) which may then be transmitted to humans through the food supply via enterococci and other bacteria. Antimicrobial-resistant enterococci, particularly high-level gentamicin resistant enterococci (HLGRE) and vancomycin-resistant enterococci (VRE) are an increasing cause of human illness and death in the United States. Gentamicin and vancomycin are important antimicrobial agents for the treatment of human enterococcal infections. Quinupristin-dalfopristin (QD), a mixture of two streptogramins, was recently approved for the treatment of vancomycin-resistant *E. faecium* infections. Although neither vancomycin nor other glycopeptides have been widely used in food animals in the United States, gentamicin and virginiamycin, an analog of QD, are frequently used for disease prevention and growth promotion in chickens.

Methods: Laboratories in Georgia, Maryland, Minnesota, and Oregon participating in the Emerging Infections Program's Enterococci Study, coordinated through the National Antimicrobial Resistance Monitoring System (NARMS) for Enteric Bacteria, used Gram positive selective medium (CNA agar), and antibiotic-resistant selective medium (Ford agar supplemented with arabinose, ampicillin, and high-level gentamicin, QD, or vancomycin) to culture human stools and chickens purchased from grocery stores. Isolates of enterococci were forwarded to CDC for species identification and antimicrobial susceptibility testing by broth microdilution.

Results: Enterococci were isolated from 229 (72%) of 320 human stools and 344 (84%) of 410 chickens. To date, 154 (67%) human isolates and 240 (70%) chicken isolates have been tested. VRE was not isolated from human stools or chickens. HLGRE was isolated from 4 (2%) human stools and 233 (68%) chickens. QD-resistant *E. faecium* was isolated from 3 (1%) human stools and 178 (52%) chickens.

Conclusion: Although no VRE were isolated, HLGRE and QD-resistant *E. faecium* were isolated from human stools and a high proportion of chickens from grocery stores. These data provide supporting evidence that use of gentamicin and virginiamycin in chickens promotes the transmission of HLGRE and QD-resistant *E. faecium* to humans. This highlights concern that the food supply can provide the "seeds" of antimicrobial-resistant enterococci which may be carried in the intestinal flora of the general population. Once introduced into a medical facility, they may blossom to clinical importance under the increased selective pressures of antimicrobial use in humans. In particular, the continued use of virginiamycin in chickens may threaten the long-term effectiveness of quinupristin-dalfopristin in humans.

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